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(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Hiroaki WATANABE et al.

Confirmation No.: 1753

Application No.: 10/684,595

Art Unit: 1773

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Examiner: D. S. Nakarani

For: HIGH BARRIER FLEXIBLE PACKAGING STRUCTURE

DECLARATION OF KEUNSUK P. CHANG

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Keunsuk P. Chang declares under penalty of perjury under the laws of the United States of America as follows:

1. I am a citizen of the United States of America, residing at 31 Mayflower Ct., North Kingstown, RI 02852, USA. I am not an inventor on this application, but I am familiar with the invention as described and claimed in the specification of this application. I received a Bachelor's degree in Chemical Engineering in 1983 from Princeton University and a Master's degree in Chemical Engineering from the University of Connecticut in 1985. After graduation, I worked at Mobil Chemical Company Films Division until 1995, working in various assignments in product development and manufacturing. In September 1996, I joined Toray Plastics (America), Inc. and

have been at Toray Plastics (America), Inc. in product development since. Currently I am Product Development Manager for the Torayfan Division of Toray Plastics (America), Inc.

2. I have reviewed the Office Action of January 31, 2006, and would like to expand upon the definition and measurement of optical density on metallized films. Optical Density (OD) is a representation of a material's light blocking ability. The optical density scale is unitless and logarithmic and is the ratio of the incident light falling upon the subject material and the light transmitted through the subject material. Thus, OD is related to light transmission. It is characterized by the following formula:

$$\text{Optical Density} = \log_{10}\left(\frac{\text{Incident light}}{\text{Transmitted light}}\right) = \log_{10}\left(\frac{100\%}{\text{Light Transmission }\%}\right) \qquad (1)$$

The term "Light Transmission" is the percentage of incident light that passes through a material.

3. A high transparency film would exhibit high light transmission such that the transmitted light is equal to the incident light, i.e., 100% light transmission. In this case, Incident light equals Transmitted light and Equation (1) reduces to:

$$\text{Optical Density} = \log_{10}\left(\frac{\text{Incident light}}{\text{Incident light}}\right) = \log_{10}\left(\frac{100\%}{100\%}\right) \qquad (2)$$

That is, the optical density of a material having 100% light transmission is equal to $\log_{10}1$, which is equal to 0.0. An opaque film, on the other hand, would exhibit low light transmission and have an optical density greater than 0.0.

4. Optical Density (OD) is generally well-suited to measuring materials that transmit only a small fraction of light, such as metallized films, due to better resolution at such low light transmissions. OD is measured by transmission densitometers. For example, this method typically is used in the industry to represent the thickness of the aluminum layer in vacuum-metallized films. Since OD is logarithmic, a OD of 0.00 indicates that 100% of the incident light falling on the sample is transmitted; a OD of 1.00 indicates that 10% of the incident light is transmitted; a OD of 2.00 indicates that 1% of the incident light is transmitted; a OD of 3.00 indicates that 0.1% of the incident light is transmitted; a OD of 4.00 indicates that 0.01% of the incident light is transmitted and an OD of 5.00 indicates that only 0.001% of the incident light is transmitted through the sample.

5. Murai's films have high transparency (as stated in Column 6, lines 24-25 of Murai) because they are formed by transparent metal oxides on transparent substrates. The optical density of such films would be very low (near 0.00) and would have very high light transmission (near 100%). Opaque metallized films could have optical densities from 1.5 to 5.0, which is equivalent to light transmissions of ca. 3% to 0.001%. Clearly, Murai's films have totally differently optical properties in terms of OD as compared to the films of the present invention.

6. Table 1 illustrates actual optical density and light transmission data of unmetallized transparent films, transparent aluminum oxide coated films, and metallized films as measured by a Tobias Associates TBX transmission densitometer and a BYK Gardner Haze-Gard Plus hazemeter in Toray Plastic (America)'s lab:

Table 1

Sample	OD	LT%
Clear OPP	0.00	92.0
AlOx OPP	0.03	85.2
Clear OPET	0.02	88.7
AlOx OPET	0.02	88.7
Met. OPP (1)	2.36	0.29
Met. OPP (2)	3.39	0.02

7. Table 1 shows that a plain, transparent biaxially oriented polypropylene film ("Clear OPP") and a transparent polyester film ("Clear OPET") exhibit optical densities of zero or nearly zero and light transmissions of about 90% (10% of the light is lost probably due to scattering and refraction in the film). Aluminum oxide coated versions of these films ("AlOx OPP" and "AlOx OPET") similarly show optical densities of nearly zero and light transmission of 85 to ca. 90%. (Murai's film would have similar OD values to these values.) On the other hand, metallized polypropylene ("Met OPP" (1) and (2)) have optical densities of 2.36 and 3.39 such that they have light transmissions of 0.29% and 0.02%, respectively. The metallized films are significantly more opaque and light blocking than the transparent films, including the aluminum oxide coated films such as Murai's films.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct. Executed at North Kingstown, RI, USA, this 27th day of April, 2006.

Keunsuk P. Chang